Appendix 6

List of Drinking Water Regulated Contaminants,
Maximum Contaminant Level (MCL),
Approved Analytical Method,
Method Detection Limit (MDL) and
Minimum Reporting Level (MRL)

Code of Federal Regulations
Data is current as of January 13, 2011
TITLE 40--Protection of Environment

PART 141--NATIONAL PRIMARY DRINKING WATER REGULATIONS

I -Methodology

A- Microbiology analysis – § 141.21 (f)

Organism	Methodology[12]	Citation[1]
Total Coliforms[2]	Total Coliform Fermentation Technique[3,4,5]	9221[a], B.
	Total Coliform Membrane Filter Technique[6]	9222[a], B, C.
	Presence-Absence (P-A) Coliform Test[5,7]	9221D.
	ONPG-MUG Test[8]	9223.
	Colisure Test.[9]	
	E*Colite®Test.[10]	
	m-ColiBlue24®Test.[11]	
	Readycult®Coliforms 100 Presence/Absence Test.[13]	
	Membrane Filter Technique using Chromocult®Coliform Agar.[14]	
	Colitag®Test.[15]	

The procedures shall be done in accordance with the documents listed below. The incorporation by reference of the following documents listed in footnotes 1, 6, 8, 9, 10 , 11, 13, 14 and 15 was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies of the documents may be obtained from the sources listed below. Information regarding obtaining these documents can be obtained from the Safe Drinking Water Hotline at 800–426–4791. Documents may be inspected at EPA's Drinking Water Docket, EPA West, 1301 Constitution Avenue, NW., EPA West, Room B102, Washington DC 20460 (Telephone: 202–566–2426); or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

[1] *Standard Methods for the Examination of Water and Wastewater,* 18th edition (1992), 19th edition (1995), or 20th edition (1998). American Public Health Association, 1015 Fifteenth Street, NW., Washington, DC 20005. The cited methods published in any of these three editions may be used. In addition, the following online versions may also be used: 9221 A, B, D–99, 9222 A, B, C–97, and 9223 B–97. Standard Methods Online are available at http://www.standardmethods.org. The year in which each method was approved by the Standard Methods Committee is designated by the last two digits in the method number. The methods listed are the only Online versions that may be used.

[2]The time from sample collection to initiation of analysis may not exceed 30 hours. Systems are encouraged but not required to hold samples below 10 deg. C during transit.

[3]Lactose broth, as commercially available, may be used in lieu of lauryl tryptose broth, if the system conducts at least 25 parallel tests between this medium and lauryl tryptose broth using the water normally tested, and this comparison demonstrates that the false-positive rate and false-negative rate for total coliform, using lactose broth, is less than 10 percent.

[4]If inverted tubes are used to detect gas production, the media should cover these tubes at least one-half to two-thirds after the sample is added.

[5]No requirement exists to run the completed phase on 10 percent of all total coliform-positive confirmed tubes.

[6]MI agar also may be used. Preparation and use of MI agar is set forth in the article, "New medium for the simultaneous detection of total coliform and *Escherichia coli* in water" by Brenner, K.P., *et. al.,* 1993, Appl. Environ. Microbiol. 59:3534–3544. Also available from the Office of Water Resource Center (RC–4100T), 1200 Pennsylvania Avenue, NW., Washington, DC 20460, EPA/600/J–99/225. Verification of colonies is not required.

[7]Six-times formulation strength may be used if the medium is filter-sterilized rather than autoclaved.

[8]The ONPG-MUG Test is also known as the Autoanalysis Collect System.

[9]A description of the Colisure Test, Feb 28, 1994, may be obtained from IDEXX Laboratories, Inc., One IDEXX Drive, Westbrook, Maine 04092. The Colisure Test may be read after an incubation time of 24 hours.

[10]A description of the E*Colite®Test, "Presence/Absence for Coliforms and *E. Coli* in Water," Dec 21, 1997, is available from Charm Sciences, Inc., 36 Franklin Street, Malden, MA 02148–4120.

[11]A description of the m-ColiBlue24®Test, Aug 17, 1999, is available from the Hach Company, 100 Dayton Avenue, Ames, IA 50010.

[12]EPA strongly recommends that laboratories evaluate the false-positive and negative rates for the method(s) they use for monitoring total coliforms. EPA also encourages laboratories to establish false-positive and false-negative rates within their own laboratory and sample matrix (drinking water or source water) with the intent that if the method they choose has an unacceptable false-positive or negative rate, another method can be used. The Agency suggests that laboratories perform these studies on a minimum of 5% of all total coliform-positive samples, except for those methods where verification/confirmation is already required, e.g., the M-Endo and LES Endo Membrane Filter Tests, Standard Total Coliform Fermentation Technique, and Presence-Absence Coliform Test. Methods for establishing false-positive and negative-rates may be based on lactose fermentation, the rapid test for β-galactosidase and cytochrome oxidase, multi-test identification systems, or equivalent confirmation tests. False-positive and false-negative information is often available in published studies and/or from the manufacturer(s).

[13]The Readycult®Coliforms 100 Presence/Absence Test is described in the document, "Readycult®Coliforms 100 Presence/Absence Test for Detection and Identification of Coliform Bacteria and *Escherichla coli* in Finished Waters", November 2000, Version 1.0, available from EM Science (an affiliate of Merck KGgA, Darmstadt Germany), 480 S. Democrat Road, Gibbstown, NJ 08027–1297. Telephone number is (800) 222–0342, e-mail address is: adellenbusch@emscience.com.

[14]Membrane Filter Technique using Chromocult®Coliform Agar is described in the document, "Chromocult®Coliform Agar Presence/Absence Membrane Filter Test Method for Detection and Identification of Coliform Bacteria and *Escherichla coli* in Finished Waters", November 2000, Version 1.0, available from EM Science (an affiliate of Merck KGgA, Darmstadt Germany), 480 S. Democrat Road, Gibbstown, NJ 08027–1297. Telephone number is (800) 222–0342, e-mail address is: adellenbusch@emscience.com.

[15]Colitag®product for the determination of the presence/absence of total coliforms and *E. coli* is described in "Colitag®Product as a Test for Detection and Identification of Coliforms and *E. coli* Bacteria in Drinking Water and Source Water as Required in National Primary Drinking Water Regulations," August 2001, available from CPI International, Inc., 5580 Skylane Blvd., Santa Rosa, CA, 95403, telephone (800) 878–7654, Fax (707) 545–7901, Internet address http://www.cpiinternational.com.

B- Inorganic analysis - § 141.23 (k)

(1) Analysis for the following contaminants shall be conducted in accordance with the methods in the following table, or their equivalent as determined by EPA. Criteria for analyzing arsenic, barium, beryllium, cadmium, calcium, chromium, copper, lead, nickel, selenium, sodium, and thallium with digestion or directly without digestion, and other analytical test procedures are contained in *Technical Notes on Drinking Water Methods,* EPA–600/R–94–173, October 1994. This document also contains approved analytical test methods which remain available for compliance monitoring until July 1, 1996. These methods will not be available for use after July 1, 1996. This document is available from the National Technical Information Service, NTIS PB95–104766, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161. The toll-free number is 800–553–6847.

Contaminant	Methodology[13]	EPA	ASTM[3]	SM[4] (18th, 19th ed.)	SM[4](20th ed.)	SM Online[22]	Other
1. Alkalinity	Titrimetric		D1067–92, 02 B	2320 B	2320 B	2320 B–97	
	Electrometric titration					I–1030–85[5]	
2. Antimony	Inductively Coupled Plasma (ICP)—Mass Spectrometry	200.8[2]					
	Hydride-Atomic Absorption		D3697–92, 02				
	Atomic Absorption; Platform	200.9[2]					
	Atomic Absorption; Furnace			3113 B		3113 B–99	
3. Arsenic[14]	Inductively Coupled Plasma[15]	200.7[2]		3120 B	3120 B	3120 B–99	

Contaminant	Methodology[13]	EPA	ASTM[3]	SM[4] (18th, 19th ed.)	SM[4](20th ed.)	SM Online[22]	Other
	ICP-Mass Spectrometry	200.8[2]					
	Atomic Absorption; Platform	200.9[2]					
	Atomic Absorption; Furnace		D2972–97, 03 C	3113 B		3113 B–99	
	Hydride Atomic Absorption		D2972–97, 03 B	3114 B		3114 B–97	
4. Asbestos	Transmission Electron Microscopy	100.1[9]					
	Transmission Electron Microscopy	100.2[10]					
5. Barium	Inductively Coupled Plasma	200.7[2]		3120 B	3120 B	3120 B–99	
	ICP-Mass Spectrometry	200.8[2]					
	Atomic Absorption; Direct			3111D		3111 D–99	
	Atomic Absorption; Furnace			3113 B		3113 B–99	
6. Beryllium	Inductively Coupled Plasma	200.7[2]		3120 B	3120 B	3120 B–99	
	ICP-Mass Spectrometry	200.8[2]					
	Atomic Absorption; Platform	200.9[2]					
	Atomic Absorption; Furnace		D3645–97, 03 B	3113 B		3113 B–99	
7. Cadmium	Inductively Coupled Plasma	200.7[2]					
	ICP-Mass Spectrometry	200.8[2]					
	Atomic Absorption; Platform	200.9[2]					
	Atomic Absorption; Furnace			3113 B		3113 B–99	
8. Calcium	EDTA titrimetric		D511–93, 03 A	3500–Ca D	3500–Ca B	3500–Ca B–97	
	Atomic Absorption; Direct Aspiration		D511–93, 03 B	3111 B		3111 B–99	
	Inductively Coupled Plasma	200.7[2]		3120 B	3120 B	3120 B–99	
	Ion Chromatography		D6919–03				
9. Chromium	Inductively Coupled Plasma	200.7[2]		3120 B	3120 B	3120 B–99	
	ICP-Mass Spectrometry	200.8[2]					
	Atomic Absorption; Platform	200.9[2]					
	Atomic Absorption; Furnace			3113 B		3113 B–99	
10. Copper	Atomic Absorption; Furnace		D1688–95, 02 C	3113 B		3113 B–99	
	Atomic Absorption; Direct Aspiration		D1688–95, 02 A	3111 B		3111 B–99	
	Inductively Coupled Plasma	200.7[2]		3120 B	3120 B	3120 B–99	
	ICP-Mass spectrometry	200.8[2]					
	Atomic Absorption; Platform	200.9[2]					

Contaminant	Methodology[13]	EPA	ASTM[3]	SM[4] (18th, 19th ed.)	SM[4](20th ed.)	SM Online[22]	Other
11. Conductivity	Conductance		D1125–95 (Reapproved 1999) A	2510 B	2510 B	2510 B–97	
12. Cyanide	Manual Distillation followed by		D2036–98 A	4500–CN^-C	4500–CN^-C		
	Spectrophotometric, Amenable		D2036–98 B	4500–CN^-G	4500–CN^-G	4500–CN^-G–99	
	Spectro-photometric Manual		D2036–98 A	4500–CN^-E	4500–CN^-E	4500–CN^-E–99	I–3300–85[5]
	Spectro-photometric Semi-automated	335.4[6]					
	Selective Electrode			4500–CN^-F	4500–CN^-F	4500–CN^-F–99	
	UV, Distillation, Spectrophotometric						Kelada–01[17]
	Micro Distillation, Flow Injection, Spectrophotometric						QuikChem 10–204–00–1–X[18]
	Ligand Exchange and Amperometry[21]		D6888–04				OIA–1677, DW[20]
13. Fluoride	Ion Chromatography	300.0[6], 300.1[19]	D4327–97, 03	4110 B	4110 B	4110 B–00	
	Manual Distill.; Color. SPADNS			4500–F^-B, D	4500–F^-B, D	4500–F^-B, D–97	
	Manual Electrode		D1179–93, 99 B	4500–F^-C	4500–F^-C	4500–F^-C–97	
	Automated Electrode						380–75WE[11]
	Automated Alizarin			4500–F^-E	4500–F^-E	4500–F^-E–97	129–71W[11]
	Capillary Ion Electrophoresis						D6508, Rev. 2[23]
14. Lead	Atomic Absorption; Furnace		D3559–96, 03 D	3113 B		3113 B–99	
	ICP–Mass spectrometry	200.8[2]					
	Atomic Absorption; Platform	200.9[2]					
	Differential Pulse Anodic Stripping Voltametry						Method 1001[16]
15. Magnesium	Atomic Absorption		D511–93, 03 B	3111 B		3111 B–99	
	ICP	200.7[2]		3120 B	3120 B	3120 B–99	
	Complexation Titrimetric Methods		D511–93, 03 A	3500–Mg E	3500–Mg B	3500–Mg B–97	
	Ion Chromatography		D6919–03				
16. Mercury	Manual, Cold Vapor	245.1[2]	D3223–97, 02	3112 B		3112 B–99	
	Automated, Cold Vapor	245.2[1]					
	ICP–Mass Spectrometry	200.8[2]					

Contaminant	Methodology[13]	EPA	ASTM[3]	SM[4] (18th, 19th ed.)	SM[4](20th ed.)	SM Online[22]	Other
17. Nickel	Inductively Coupled Plasma	200.7[2]		3120 B	3120 B	3120 B–99	
	ICP–Mass Spectrometry	200.8[2]					
	Atomic Absorption; Platform	200.9[2]					
	Atomic Absorption; Direct			3111 B		3111 B–99	
	Atomic Absorption; Furnace			3113 B		3113 B–99	
18. Nitrate	Ion Chromatography	300.0[6]300.1[19]	D4327–97, 03	4110 B	4110 B	4110 B–00	B–1011[8]
	Automated Cadmium Reduction	353.2[6]	D3867–90 A	4500–NO3⁻F	4500–NO3⁻F	4500–NO3⁻F–00	
	Ion Selective Electrode			4500–NO3⁻D	4500–NO3⁻D	4500–NO3⁻D–00	601[7]
	Manual Cadmium Reduction		D3867–90 B	4500–NO3⁻E	4500–NO3⁻E	4500–NO3⁻E–00	
	Capillary Ion Electrophoresis						D6508, Rev. 2[23]
19. Nitrite	Ion Chromatography	300.0[6]300.1[19]	D4327–97, 03	4110 B	4110 B	4110 B–00	B–1011[8]
	Automated Cadmium Reduction	353.2[6]	D3867–90 A	4500–NO3⁻F	4500–NO3⁻F	4500–NO3⁻F–00	
	Manual Cadmium Reduction		D3867–90 B	4500–NO3⁻E	4500–NO3⁻E	4500–NO3⁻E–00	
	Spectrophotometric			4500–NO2⁻B	4500–NO2⁻B	4500–NO2⁻B–00	
	Capillary Ion Electrophoresis						D6508, Rev. 2[23]
20. Ortho-phosphate[12]	Colorimetric, Automated, Ascorbic Acid	365.1[6]		4500–P F	4500–P F		
	Colorimetric, ascorbic acid, single reagent		D515–88 A	4500–P E	4500–P E		
	Colorimetric Phosphomolybdate;						I–1601–85[5]
	Automated-segmented flow;						I–2601–90[5]
	Automated Discrete						I–2598–85[5]
	Ion Chromatography	300.0[6] 300.1[19]	D4327–97, 03	4110 B	4110 B	4110 B–00	
	Capillary Ion Electrophoresis						D6508, Rev. 2[23]
21. pH	Electrometric	150.1, 150.2[1]	D1293–95, 99	4500–H⁺B	4500–H⁺B	4500–H⁺B–00	
22. Selenium	Hydride-Atomic Absorption		D3859–98, 03 A	3114 B		3114 B–97	
	ICP–Mass Spectrometry	200.8[2]					
	Atomic Absorption; Platform	200.9[2]					
	Atomic Absorption; Furnace		D3859–98, 03 B	3113 B		3113 B–99	
23. Silica	Colorimetric, Molybdate Blue						I–1700–85[5]

Contaminant	Methodology[13]	EPA	ASTM[3]	SM[4] (18th, 19th ed.)	SM[4](20th ed.)	SM Online[22]	Other
	Automated-segmented Flow						I–2700–85[5]
	Colorimetric		D859–94, 00				
	Molybdosilicate			4500–Si D	4500–SiO2 C	4500–SiO2 C–97	
	Heteropoly blue			4500–Si E	4500–SiO2 D	4500–SiO2 D–97	
	Automated for Molybdate-reactive Silica			4500–Si F	4500–SiO2 E	4500–SiO2 E–97	
	Inductively Coupled Plasma	200.7[2]		3120 B	3120 B	3120 B–99	
24. Sodium	Inductively Coupled Plasma	200.7[2]					
	Atomic Absorption; Direct Aspiration			3111 B		3111 B–99	
	Ion Chromatography		D6919–03				
25. Temperature	Thermometric			2550	2550	2550–00	
26. Thallium	ICP–Mass Spectrometry	200.8[2]					
	Atomic Absorption; Platform	200.9[2]					

The procedures shall be done in accordance with the documents listed below. The incorporation by reference of the following documents listed in footnotes 1–11, 16–20, and 22–23 was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies of the documents may be obtained from the sources listed below. Information regarding obtaining these documents can be obtained from the Safe Drinking Water Hotline at 800–426–4791. Documents may be inspected at EPA's Drinking Water Docket, EPA West, 1301 Constitution Avenue, NW., Room 3334, Washington, DC 20460 (Telephone: 202–566–2426); or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html .

[1]"Methods for Chemical Analysis of Water and Wastes," EPA/600/4–79/020, March 1983. Available at NTIS, PB84–128677.

[2]"Methods for the Determination of Metals in Environmental Samples—Supplement I," EPA/600/R–94/111, May 1994. Available at NTIS, PB95–125472.

[3] *Annual Book of ASTM Standards,* 1994, 1996, 1999, or 2003, Vols. 11.01 and 11.02, ASTM International; any year containing the cited version of the method may be used. The previous versions of D1688–95A, D1688–95C (copper), D3559–95D (lead), D1293–95 (pH), D1125–91A (conductivity) and D859–94 (silica) are also approved. These previous versions D1688–90A, C; D3559–90D, D1293–84, D1125–91A and D859–88, respectively are located in the *Annual Book of ASTM Standards,* 1994, Vol. 11.01. Copies may be obtained from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

[4] *Standard Methods for the Examination of Water and Wastewater,* 18th edition (1992), 19th edition (1995), or 20th edition (1998). American Public Health Association, 1015 Fifteenth Street, NW., Washington, DC 20005. The cited methods published in any of these three editions may be used, except that the versions of 3111 B, 3111 D, 3113 B and 3114 B in the 20th edition may not be used.

[5]Method I–2601–90, Methods for Analysis by the U.S. Geological Survey National Water Quality Laboratory—Determination of Inorganic and Organic Constituents in Water and Fluvial Sediment, Open File Report 93–125, 1993; For Methods I–1030–85; I–1601–85; I–1700–85; I–2598–85; I–2700–85; and I–3300–85 See Techniques of Water Resources Investigation of the U.S. Geological Survey, Book 5, Chapter A–1, 3rd edition., 1989; Available from Information Services, U.S. Geological Survey, Federal Center, Box 25286, Denver, CO 80225–0425.

[6]"Methods for the Determination of Inorganic Substances in Environmental Samples," EPA/600/R–93/100, August 1993. Available at NTIS, PB94–120821.

[7]The procedure shall be done in accordance with the Technical Bulletin 601 " Standard Method of Test for Nitrate in Drinking Water," July 1994, PN 221890–001, Analytical Technology, Inc. Copies may be obtained from ATI Orion, 529 Main Street, Boston, MA 02129.

[8]Method B–1011, "Waters Test Method for Determination of Nitrite/Nitrate in Water Using Single Column Ion Chromatography," August 1987. Copies may be obtained from Waters Corporation, Technical Services Division, 34 Maple Street, Milford, MA 01757, Telephone: 508/482–2131, Fax: 508/482–3625.

[9]Method 100.1, "Analytical Method For Determination of Asbestos Fibers in Water," EPA/600/4–83/043, EPA, September 1983. Available at NTIS, PB83–260471.

[10]Method 100.2, "Determination of Asbestos Structure Over 10-μm In Length In Drinking Water," EPA/600/R–94/134, June 1994. Available at NTIS, PB94–201902.

[11]Industrial Method No. 129–71W, "Fluoride in Water and Wastewater," December 1972, and Method No. 380–75WE, "Fluoride in Water and Wastewater," February 1976, Technicon Industrial Systems. Copies may be obtained from Bran & Luebbe, 1025 Busch Parkway, Buffalo Grove, IL 60089.

[12]Unfiltered, no digestion or hydrolysis.

[13]Because MDLs reported in EPA Methods 200.7 and 200.9 were determined using a 2x preconcentration step during sample digestion, MDLs determined when samples are analyzed by direct analysis (*i.e.* , no sample digestion) will be higher. For direct analysis of cadmium and arsenic by Method 200.7, and arsenic by Method 3120 B, sample preconcentration using pneumatic nebulization may be required to achieve lower detection limits. Preconcentration may also be required for direct analysis of antimony, lead, and thallium by Method 200.9; antimony and lead by Method 3113 B; and lead by Method D3559–90D, unless multiple in-furnace depositions are made.

[14]If ultrasonic nebulization is used in the determination of arsenic by Methods 200.7, 200.8, or SM 3120 B, the arsenic must be in the pentavalent state to provide uniform signal response. For Methods 200.7 and 3120 B, both samples and standards must be diluted in the same mixed acid matrix concentration of nitric and hydrochloric acid with the addition of 100 μL of 30% hydrogen peroxide per 100 mL of solution. For direct analysis of arsenic with Method 200.8 using ultrasonic nebulization, samples and standards must contain 1 mg/L of sodium hypochlorite.

[15]Starting January 23, 2006, analytical methods using the ICP–AES technology may not be used because the detection limits for these methods are 0.008 mg/L or higher. This restriction means that the two ICP–AES methods (EPA Method 200.7 and SM 3120 B) approved for use for the MCL of 0.05 mg/L may not be used for compliance determinations for the revised MCL of 0.010 mg/L. However, prior to January 23, 2006, systems may have compliance samples analyzed with these less sensitive methods.

[16]The description for Method Number 1001 for lead is available from Palintest, LTD, 21 Kenton Lands Road, P.O. Box 18395, Erlanger, KY 41018. Or from the Hach Company, P.O. Box 389, Loveland, CO 80539.

[17]The description for the Kelada-01 Method, "Kelada Automated Test Methods for Total Cyanide, Acid Dissociable Cyanide, And Thiocyanate," Revision 1.2, August 2001, EPA # 821–B–01–009 for cyanide is available from the National Technical Information Service (NTIS), PB 2001–108275, 5285 Port Royal Road, Springfield, VA 22161. The toll free telephone number is 800–553–6847.**Note:**A 450–W UV lamp may be used in this method instead of the 550–W lamp specified if it provides performance within the quality control (QC) acceptance criteria of the method in a given instrument. Similarly, modified flow cell configurations and flow conditions may be used in the method, provided that the QC acceptance criteria are met.

[18]The description for the QuikChem Method 10–204–00–1–X, "Digestion and distillation of total cyanide in drinking and wastewaters using MICRO DIST and determination of cyanide by flow injection analysis," Revision 2.1, November 30, 2000, for cyanide is available from Lachat Instruments, 6645 W. Mill Rd., Milwaukee, WI 53218. Telephone: 414–358–4200.

[19]"Methods for the Determination of Organic and Inorganic Compounds in Drinking Water," Vol. 1, EPA 815–R–00–014, August 2000. Available at NTIS, PB2000–106981.

[20]Method OIA–1677, DW "Available Cyanide by Flow Injection, Ligand Exchange, and Amperometry," January 2004. EPA–821–R–04–001, Available from ALPKEM, A Division of OI Analytical, P.O. Box 9010, College Station, TX 77842–9010.

[21]Sulfide levels below those detected using lead acetate paper may produce positive method interferences. Test samples using a more sensitive sulfide method to determine if a sulfide interference is present, and treat samples accordingly.

[22]Standard Methods Online are available at http://www.standardmethods.org . The year in which each method was approved by the Standard Methods Committee is designated by the last two digits in the method number. The methods listed are the only online versions that may be used.

[23]Method D6508, Rev. 2, "Test Method for Determination of Dissolved Inorganic Anions in Aqueous Matrices Using Capillary Ion Electrophoresis and Chromate Electrolyte," available from Waters Corp, 34 Maple St, Milford, MA, 01757, Telephone: 508/482–2131, Fax: 508/482–3625.

C- Organic Contaminants - § 141.24 (e)

(e) Analyses for the contaminants in this section shall be conducted using the following EPA methods or their equivalent as approved by EPA.

(1) The following documents are incorporated by reference. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies may be inspected at EPA's Drinking Water Docket, 1301 Constitution Avenue, NW., EPA West, Room 3334, Washington, DC 20460 (Telephone: 202–566–2426); or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.* Method 508A

and 515.1 are in *Methods for the Determination of Organic Compounds in Drinking Water,* EPA/600/4–88–039, December 1988, Revised, July 1991. Methods 547, 550 and 550.1 are in *Methods for the Determination of Organic Compounds in Drinking Water—Supplement I,* EPA/600–4–90–020, July 1990. Methods 548.1, 549.1, 552.1 and 555 are in *Methods for the Determination of Organic Compounds in Drinking Water—Supplement II,* EPA/600/R–92–129, August 1992. Methods 502.2, 504.1, 505, 506, 507, 508, 508.1, 515.2, 524.2 525.2, 531.1, 551.1 and 552.2 are in *Methods for the Determination of Organic Compounds in Drinking Water—Supplement III,* EPA/600/R–95–131, August 1995. Method 1613 is titled "Tetra–through Octa–Chlorinated Dioxins and Furans by Isotope–Dilution HRGC/HRMS," EPA/821–B–94–005, October 1994. These documents are available from the National Technical Information Service, NTIS PB91–231480, PB91–146027, PB92–207703, PB95–261616 and PB95–104774, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161. The toll free number is: 800–553–6847. Method 6651 shall be followed in accordance with *Standard Methods for the Examination of Water and Wastewater,* 18th edition (1992), 19th edition (1995), or 20th edition (1998), American Public Health Association (APHA); any of these three editions may be used. Method 6610 shall be followed in accordance with *Standard Methods for the Examination of Water and Wastewater,* (18th Edition Supplement) (1994), or with the 19th edition (1995) or 20th edition (1998) of *Standard Methods for the Examination of Water and Wastewater;* any of these publications may be used. The APHA documents are available from APHA, 1015 Fifteenth Street NW., Washington, DC 20005. Other required analytical test procedures germane to the conduct of these analyses are contained in *Technical Notes on Drinking Water Methods,* EPA/600/R–94–173, October 1994, NTIS PB95–104766. EPA Methods 515.3 and 549.2 are available from U.S. Environmental Protection Agency, National Exposure Research Laboratory (NERL)–Cincinnati, 26 West Martin Luther King Drive, Cincinnati, OH 45268. ASTM Method D 5317–93, 98 (Reapproved 2003) is available in the *Annual Book of ASTM Standards,* (1999), Vol. 11.02, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428, any edition containing the cited version of the method may be used. EPA Method 515.4, "Determination of Chlorinated Acids in Drinking Water by Liquid-Liquid Microextraction, Derivatization and Fast Gas Chromatography with Electron Capture Detection," Revision 1.0, April 2000, EPA/815/B–00/001 and EPA Method 552.3, "Determination of Haloacetic Acids and Dalapon in Drinking Water by Liquid-Liquid Microextraction, Derivatization, and Gas Chromatography with Electron Capture Detection," Revision 1.0, July 2003, EPA 815–B–03–002, can be accessed and downloaded directly online at http://www.epa.gov/safewater/methods/sourcalt.html. Syngenta Method AG–625, "Atrazine in Drinking Water by Immunoassay," February 2001, is available from Syngenta Crop Protection, Inc., 410 Swing Road, P.O. Box 18300, Greensboro, NC 27419. Telephone: 336–632–6000. Method 531.2 "Measurement of N-methylcarbamoyloximes and N-methylcarbamates in Water by Direct Aqueous Injection HPLC with Postcolumn Derivatization," Revision 1.0, September 2001, EPA 815–B–01–002, can be accessed and downloaded directly online at http://www.epa.gov/safewater/methods/sourcalt.html.

Contaminant	EPA method[1]	Standard methods	ASTM	Other
1. Benzene	502.2, 524.2			
2. Carbon tetrachloride	502.2, 524.2, 551.1			
3. Chlorobenzene	502.2, 524.2			
4. 1,2-Dichlorobenzene	502.2, 524.2			
5. 1,4-Dichlorobenzene	502.2, 524.2			
6. 1,2-Dichloroethane	502.2, 524.2			
7. cis-Dichloroethylene	502.2, 524.2			

Contaminant	EPA method[1]	Standard methods	ASTM	Other
8. trans-Dichloroethylene	502.2, 524.2			
9. Dichloromethane	502.2, 524.2			
10. 1,2-Dichloropropane	502.2, 524.2			
11. Ethylbenzene	502.2, 524.2			
12. Styrene	502.2, 524.2			
13. Tetrachloroethylene	502.2, 524.2, 551.1			
14. 1,1,1-Trichloroethane	502.2, 524.2, 551.1			
15. Trichloroethylene	502.2, 524.2, 551.1			
16. Toluene	502.2, 524.2			
17. 1,2,4-Trichlorobenzene	502.2, 524.2			
18. 1,1-Dichloroethylene	502.2, 524.2			
19. 1,1,2-Trichloroethane	502.2, 524.2, 551.1			
20. Vinyl chloride	502.2, 524.2			
21. Xylenes (total)	502.2, 524.2			
22. 2,3,7,8-TCDD (dioxin)	1613			
23. 2,4–D[4](as acids, salts, and esters)	515.2, 555, 515.1, 515.3, 515.4		D5317–93, 98 (Reapproved 2003)	
24. 2,4,5–TP[4](Silvex)	515.2, 555, 515.1, 515.3, 515.4		D5317–93, 98 (Reapproved 2003)	
25. Alachlor[2]	507, 525.2, 508.1, 505, 551.1			
26. Atrazine[2]	507, 525.2, 508.1, 505, 551.1			Syngenta[5]AG–625
27. Benzo(a)pyrene	525.2, 550, 550.1			
28. Carbofuran	531.1, 531.2	6610		
29. Chlordane	508, 525.2, 508.1, 505			
30. Dalapon	552.1 515.1, 552.2, 515.3, 515.4, 552.3			
31. Di(2-ethylhexyl)adipate	506, 525.2			
32. Di(2-ethylhexyl)phthalate	506, 525.2			
33. Dibromochloropropane (DBCP)	504.1, 551.1			
34. Dinoseb[4]	515.2, 555, 515.1, 515.3, 515.4			
35. Diquat	549.2			
36. Endothall	548.1			
37. Endrin	508, 525.2, 508.1, 505, 551.1			

Contaminant	EPA method[1]	Standard methods	ASTM	Other
38. Ethylene dibromide (EDB)	504.1, 551.1			
39. Glyphosate	547	6651		
40. Heptachlor	508, 525.2, 508.1, 505, 551.1			
41. Heptachlor Epoxide	508, 525.2, 508.1, 505, 551.1			
42. Hexachlorobenzene	508, 525.2, 508.1, 505, 551.1			
43. Hexachlorocyclopentadiene	508, 525.2, 508.1, 505, 551.1			
44. Lindane	508, 525.2, 508.1, 505, 551.1			
45. Methoxychlor	508, 525.2, 508.1, 505, 551.1			
46. Oxamyl	531.1, 531.2	6610		
47. PCBs[3](as decachlorobiphenyl)	508[a]			
48. PCBs[3](as Aroclors)	508.1, 508, 525.2, 505			
49. Pentachlorophenol	515.2, 525.2, 555, 515.1, 515.3, 515.4		D5317–93, 98 (Reapproved 2003)	
50. Picloram[4]	515.2, 555, 515.1, 515.3, 515.4		D5317–93, 98 (Reapproved 2003)	
51. Simazine[2]	507, 525.2, 508.1, 505, 551.1			
52. Toxaphene	508, 508.1, 525.2, 505			
53. Total Trihalomethanes	502.2, 524.2, 551.1			

[1]For previously approved EPA methods which remain available for compliance monitoring until June 1, 2001, see paragraph (e)(2) of this section.

[2]Substitution of the detector specified in Method 505, 507, 508 or 508.1 for the purpose of achieving lower detection limits is allowed as follows. Either an electron capture or nitrogen phosphorous detector may be used provided all regulatory requirements and quality control criteria are met.

[3]PCBs are qualitatively identified as Aroclors and measured for compliance purposes as decachlorobiphenyl. Users of Method 505 may have more difficulty in achieving the required detection limits than users of Methods 508.1, 525.2 or 508.

[4]Accurate determination of the chlorinated esters requires hydrolysis of the sample as described in EPA Methods 515.1, 515.2, 515.3, 515.4 and 555 and ASTM Method D5317–93.

[5]This method may not be used for the analysis of atrazine in any system where chlorine dioxide is used for drinking water treatment. In samples from all other systems, any result for atrazine generated by Method AG–625 that is greater than one-half the maximum contaminant level (MCL) (in other words, greater than 0.0015mg/L or 1.5 µg/L) must be confirmed using another approved method for this contaminant and should use additional volume of the original sample collected for compliance monitoring. In instances where a result from Method AG–625 triggers such confirmatory testing, the confirmatory result is to be used to determine compliance.

Approved Methods for Disinfection Byproduct Compliance Monitoring - § 141. 131 (b)

Contaminant and methodology[1]	EPA method	Standard method[2]	SM online[9]	ASTM method[3]
TTHM				
P&T/GC/ElCD & PID	502.2[4]			
P&T/GC/MS	524.2			
LLE/GC/ECD	551.1			
HAA5				
LLE (diazomethane)/GC/ECD		6251 B[5]	6251 B–94	
SPE (acidic methanol)/GC/ECD	552.1[5]			
LLE (acidic methanol)/GC/ECD	552.2, 552.3			

Contaminant and methodology[1]	EPA method	Standard method[2]	SM online[9]	ASTM method[3]
Bromate				
Ion chromatography	300.1			D 6581–00
Ion chromatography & post column reaction	317.0 Rev 2.0[6], 326.0[6]			
IC/ICP–MS	321.8[6,7]			
Chlorite				
Amperometric titration		4500–ClO_2E[8]	4500–ClO_2E–00[8]	
Spectrophotometry	327.0 Rev 1.1[8]			
Ion chromatography	300.0, 300.1, 317.0 Rev 2.0, 326.0			D 6581–00

[1]P&T = purge and trap; GC = gas chromatography; ElCD = electrolytic conductivity detector; PID = photoionization detector; MS = mass spectrometer; LLE = liquid/liquid extraction; ECD = electron capture detector; SPE = solid phase extraction; IC = ion chromatography; ICP–MS = inductively coupled plasma/mass spectrometer.

[2]19th and 20th editions of Standard Methods for the Examination of Water and Wastewater, 1995 and 1998, respectively, American Public Health Association; either of these editions may be used.

[3]Annual Book of ASTM Standards, 2001 or any year containing the cited version of the method, Vol 11.01.

[4]If TTHMs are the only analytes being measured in the sample, then a PID is not required.

[5]The samples must be extracted within 14 days of sample collection.

[6]Ion chromatography & post column reaction or IC/ICP-MS must be used for monitoring of bromate for purposes of demonstrating eligibility of reduced monitoring, as prescribed in §141.132(b)(3)(ii).

[7]Samples must be preserved at the time of sampling with 50 mg ethylenediamine (EDA)/L of sample and must be analyzed within 28 days.

[8]Amperometric titration or spectrophotometry may be used for routine daily monitoring of chlorite at the entrance to the distribution system, as prescribed in §141.132(b)(2)(i)(A). Ion chromatography must be used for routine monthly monitoring of chlorite and additional monitoring of chlorite in the distribution system, as prescribed in §141.132(b)(2)(i)(B) and (b)(2)(ii).

[9]The Standard Methods Online version that is approved is indicated by the last two digits in the method number which is the year of approval by the Standard Method Committee. Standard Methods Online are available at http://www.standardmethods.org.

(iv) Beginning April 1, 2007, report quantitative data for concentrations at least as low as the ones listed in the following table for all DBP samples analyzed for compliance with §§141.64, 141.135, and subparts U and V of this part:

DBP	Minimum reporting level (mg/L)[1]	Comments
TTHM[2]		
Chloroform	0.0010	
Bromodichloromethane	0.0010	
Dibromochloromethane	0.0010	
Bromoform	0.0010	
HAA5[2]		
Monochloroacetic Acid	0.0020	
Dichloroacetic Acid	0.0010	
Trichloroacetic Acid	0.0010	
Monobromoacetic Acid	0.0010	
Dibromoacetic Acid	0.0010	
Chlorite	0.020	Applicable to monitoring as prescribed in §141.132(b)(2)(1)(B) and (b)(2)(ii).
Bromate	0.0050 or 0.0010	Laboratories that use EPA Methods 317.0 Revision 2.0, 326.0 or 321.8 must meet a 0.0010 mg/L MRL for bromate.

(c) *Disinfectant residuals.* (1) Systems must measure residual disinfectant concentrations for free chlorine, combined chlorine (chloramines), and chlorine dioxide by the methods listed in the following table:

Methodology	SM (19th or 20th ed)	SM Online[2]	ASTM method	EPA method	Residual measured[1]			
					Free Cl_2	Combined Cl_2	Total Cl_2	ClO_2
Amperometric Titration	4500–Cl D	4500–Cl D–00	D 1253–86 (96), 03		X	X	X	
Low Level Amperometric Titration	4500–Cl E	4500–Cl E–00					X	
DPD Ferrous Titrimetric	4500–Cl F	4500–Cl F–00			X	X	X	
DPD Colorimetric	4500–Cl G	4500–Cl G–00			X	X	X	
Syringaldazine (FACTS)	4500–Cl H	4500–Cl H–00			X			
Iodometric Electrode	4500–Cl I	4500–Cl I–00					X	
DPD	4500–ClO_2D							X
Amperometric Method II	4500–ClO_2E	4500–ClO_2E–00						X
Lissamine Green Spectrophotometric				327.0 Rev 1.1				X

[1]X indicates method is approved for measuring specified disinfectant residual. Free chlorine or total chlorine may be measured for demonstrating compliance with the chlorine MRDL and combined chlorine, or total chlorine may be measured for demonstrating compliance with the chloramine MRDL.

[2]The Standard Methods Online version that is approved is indicated by the last two digits in the method number which is the year of approval by the Standard Method Committee. Standard Methods Online are available at http://www.standardmethods.org.

D- Radionuclides - § 141. 25 (a)

Contaminant	Methodology	Reference (Method of Page Number)								
		EPA[1]	EPA[2]	EPA[3]	EPA[4]	SM[5]	ASTM[6]	USGS[7]	DOE[8]	Other
Naturally Occurring:										
Gross alpha[11] and beta	Evaporation	900.0	p. 1	00–01	p. 1	302, 7110 B, 7110 B–00		R–1120–76		
Gross alpha[11]	Coprecipitation			00–02		7110 C, 7110 C–00				
Radium 226	Radon emanation	903.1	p. 16	Ra–04	p. 19	305, 7500–Ra C, 7500–Ra C–01	D3454–97	R–1141–76	Ra-04	NY[9],
	Radiochemical	903.0	p. 13	Ra-03		304, 7500–Ra B, 7500–Ra B–01	D2460–97	R–1140–76		GA[14]

Contaminant	Methodology	Reference (Method of Page Number)								
		EPA[1]	EPA[2]	EPA[3]	EPA[4]	SM[5]	ASTM[6]	USGS[7]	DOE[8]	Other
Radium 228	Radiochemical	904.0	p. 24	Ra-05	p. 19	7500–Ra D, 7500–Ra D–01		R–1142–76		NY[9], NJ[10], GA[14]
Uranium[12]	Radiochemical	908.0				7500–U B, 7500–U B–00				
	Fluorometric	908.1				7500–U C (17th Ed.)	D2907–97	R–1180–76, R–1181–76	U–04	
	ICP–MS	200.8[13]				3125	D5673–03			
	Alpha Spectrometry			00–07	p. 33	7500–U C (18th, 19th, or 20th Ed.), 7500–U C–00	D3972–97, 02	R–1182–76	U–02	
	Laser Phosphorimetry						D5174–97, 02			
Man-Made:										
Radioactive Cesium	Radiochemical	901.0	p. 4			7500–Cs B, 7500–Cs B–00	D2459–72	R–1111–76		
	Gamma Ray Spectrometry	901.1			p. 92	7120, 7120–97	D3649–91, 98[a]	R–1110–76	4.5.2.3	
Radioactive Iodine	Radiochemical	902.0	p. 6			7500–I B, 7500–I B–00				
			p. 9			7500–I C, 7500–I C–00				
						7500–I D, 7500–I D–00	D3649–91, 98[a]			
	Gamma Ray Spectrometry	901.1			p. 92	7120, 7120–97	D4785–93, 00a		4.5.2.3	
Radioactive Strontium 89, 90	Radiochemical	905.0	p. 29	Sr–04	p. 65	303, 7500–Sr B, 7500–		R–1160–76	Sr–01, Sr–02	

Contaminant	Methodology	Reference (Method of Page Number)								
		EPA[1]	EPA[2]	EPA[3]	EPA[4]	SM[5]	ASTM[6]	USGS[7]	DOE[8]	Other
						Sr B–01				
Tritium	Liquid Scintillation	906.0	p. 34	H–02	p. 87	306, 7500–^{3}H B, 7500–^{3}H B–00	D4107–91, 98 (Reapproved 2002)	R–1171–76		
Gamma Emitters	Gamma Ray Spectrometry	901.1			p. 92	7120, 7120–97	D3649–91, 98[a]	R–1110–76	Ga–01–R	
		902.0				7500–Cs B, 7500–Cs B–00	D4785–93, 00a			
		901.0				7500–I B, 7500–I B–00				

The procedures shall be done in accordance with the documents listed below. The incorporation by reference of documents 1 through 10 and 13 through 14 was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies of the documents may be obtained from the sources listed below. Information regarding obtaining these documents can be obtained from the Safe Drinking Water Hotline at 800–426–4791. Documents may be inspected at EPA's Drinking Water Docket, EPA West, 1301 Constitution Avenue, NW., Room 3334 , Washington, DC 20460 (Telephone: 202–566–2426); or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

[1]"Prescribed Procedures for the Measurement of Radioactivity in Drinking Water," EPA 600/4–80–032, August 1980. Available at the U.S. Department of Commerce, National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161 (Telephone 800–553–6847), PB 80–224744.

[2]"Interim Radiochemical Methodology for Drinking Water," EPA 600/4–75–008 (revised), March 1976. Available NTIS, ibid.

[3]"Radiochemistry Procedures Manual," EPA 520/5–84–006, December 1987. Available NTIS, ibid.

[4]"Radiochemical Analytical Procedures for Analysis of Environmental Samples," March 1979. Available at NTIS, ibid. EMSL LV 053917.

[5]"Standard Methods for the Examination of Water and Wastewater," 13th, 17th, 18th, 19th or 20th edition, 1971, 1989, 1992, 1995, 1998. Available at American Public Health Association, 1015 Fifteenth Street, NW., Washington, DC 20005. Methods 302, 303, 304, 305 and 306 are only in the 13th edition. Methods 7110B, 7500–Ra B, 7500–Ra C, 7500–Ra D, 7500–U B, 7500–Cs B, 7500–I B, 7500–I C, 7500–I D, 7500–Sr B, and 7500–^{3}H B are in the 17th, 18th, 19th and 20th editions. Method 7110 C is in the 18th, 19th and 20th editions. Method 7500–U C Fluorometric Uranium is only in the 17th Edition, and 7500–U C Alpha spectrometry is only in the 18th, 19th and 20th editions. Method 7120 is only in the 19th and 20th editions. Method 3125 is only in the 20th edition. Methods 7110 B–00, 7110 C–00, 7500–Ra B–01, 7500–Ra C–01, 7500–Ra D–01, 7500–U B–00, 7500–U C–00, 7500–I B–00, 7500–I C–00, 7500–I D–00, 7120–97, 7500–Sr B–01, and 7500–^{3}H B–00 are available online at http://www.standardmethods.org. The year in which each method was approved by the Standard Methods Committee is designated by the last two digits in the method number. The methods listed are the only online versions that may be used.

[6] *Annual Book of ASTM Standards,* Vol. 11.01 and 11.02, 2002; ASTM International; any year containing the cited version of the method may be used. Copies of these two volumes and the 2003 version of D 5673–03 may be obtained from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428–2959.

[7]"Methods for Determination of Radioactive Substances in Water and Fluvial Sediments," Chapter A5 in Book 5 of *Techniques of Water-Resources Investigations of the United States Geological Survey,* 1977. Available at U.S. Geological Survey (USGS) Information Services, Box 25286, Federal Center, Denver, CO 80225–0425.

[8]"EML Procedures Manual," 28th (1997) or 27th (1990) Editions, Volumes 1 and 2; either edition may be used. In the 27th Edition Method Ra-04 is listed as Ra-05 and Method Ga-01–R is listed as Sect. 4.5.2.3. Available at the Environmental Measurements Laboratory, U.S. Department of Energy (DOE), 376 Hudson Street, New York, NY 10014–3621.

[9]"Determination of Ra–226 and Ra–228 (Ra–02)," January 1980, Revised June 1982. Available at Radiological Sciences Institute for Laboratories and Research, New York State Department of Health, Empire State Plaza, Albany, NY 12201.

[10]"Determination of Radium 228 in Drinking Water," August 1980. Available at State of New Jersey, Department of Environmental Protection, Division of Environmental Quality, Bureau of Radiation and Inorganic Analytical Services, 9 Ewing Street, Trenton, NJ 08625.

[11]Natural uranium and thorium-230 are approved as gross alpha calibration standards for gross alpha with co-precipitation and evaporation methods; americium-241 is approved with co-precipitation methods.

[12]If uranium (U) is determined by mass, a 0.67 pCi/µg of uranium conversion factor must be used. This conversion factor is based on the 1:1 activity ratio of U–234 and U–238 that is characteristic of naturally occurring uranium.

[13]"Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma-Mass Spectrometry," Revision 5.4, which is published in "Methods for the Determination of Metals in Environmental Samples—Supplement I," EPA 600–R–94–111, May 1994. Available at NTIS, PB 95–125472.

[14]"The Determination of Radium-226 and Radium-228 in Drinking Water by Gamma-ray Spectrometry Using HPGE or Ge(Li) Detectors," Revision 1.2, December 2004. Available from the Environmental Resources Center, Georgia Institute of Technology, 620 Cherry Street, Atlanta, GA 30332–0335, USA, Telephone: 404–894–3776. This method may be used to analyze for radium-226 and radium-228 in samples collected after January 1, 2005 to satisfy the radium-226 and radium-228 monitoring requirements specified at 40 CFR 141.26.

§ 141. 74 (a)

Residual	Methodology	SM[1]	SM Online[2]	Other
Free Chlorine	Amperometric Titration	4500–Cl D	4500–Cl D–00	D1253–03[3]
	DPD Ferrous Titrimetric	4500–Cl F	4500–Cl F–00	
	DPD Colorimetric	4500–Cl G	4500–Cl G–00	
	Syringaldazine (FACTS)	4500–Cl H	4500–Cl H–00	
Total Chlorine	Amperometric Titration	4500–Cl D	4500–Cl D–00	D1253–03[3]
	Amperometric Titration (low level measurement)	4500–Cl E	4500–Cl E–00	
	DPD Ferrous Titrimetric	4500–Cl F	4500–Cl F–00	
	DPD Colorimetric	4500–Cl G	4500–Cl G–00	
	Iodometric Electrode	4500–Cl I	4500–Cl I–00	
Chlorine Dioxide	Amperometric Titration	4500–ClO2 C	4500–ClO2 C–00	
	DPD Method	4500–ClO2 D		
	Amperometric Titration	4500–ClO2 E	4500–ClO2 E–00	
	Spectrophotometric			327.0, Revision 1.1[4]
Ozone	Indigo Method	4500–O3 B	4500–O3 B–97	

[1]All the listed methods are contained in the 18th, 19th, and 20th editions of *Standard Methods for the Examination of Water and Wastewater*, 1992, 1995, and 1998; the cited methods published in any of these three editions may be used.

[2]Standard Methods Online are available at http://www.standardmethods.org. The year in which each method was approved by the Standard Methods Committee is designated by the last two digits in the method number. The methods listed are the only Online versions that may be used.

[3] *Annual Book of ASTM Standards*, Vol. 11.01, 2004 ; ASTM International; any year containing the cited version of the method may be used. Copies of this method may be obtained from ASTM International, 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken, PA 19428–2959.

[4]EPA Method 327.0, Revision 1.1, "Determination of Chlorine Dioxide and Chlorite Ion in Drinking Water Using Lissamine Green B and Horseradish Peroxidase with Detection by Visible Spectrophotometry," USEPA, May 2005, EPA 815–R–05–008. Available online at http://www.epa.gov/safewater/methods/sourcalt.html.

E- Lead and Copper - § 141.89

(a) Analyses for lead, copper, pH, conductivity, calcium, alkalinity, orthophosphate, silica, and temperature shall be conducted with the methods in §141.23(k) (1).

(1) Analyses for alkalinity, calcium, conductivity, orthophosphate, pH, silica, and temperature may be performed by any person acceptable to the State. Analyses under this section for lead and copper shall

only be conducted by laboratories that have been certified by EPA or the State. To obtain certification to conduct analyses for lead and copper, laboratories must:

(i) Analyze Performance Evaluation samples, which include lead and copper, provided by or acceptable to EPA or the State at least once a year by each method for which the laboratory desires certification; and

(ii) Achieve quantitative acceptance limits as follows:

(A) For lead: ±30 percent of the actual amount in the Performance Evaluation sample when the actual amount is greater than or equal to 0.005 mg/L. The Practical Quantitation Level, or PQL for lead is 0.005 mg/L.

(B) For Copper: ±10 percent of the actual amount in the Performance Evaluation sample when the actual amount is greater than or equal to 0.050 mg/L. The Practical Quantitation Level, or PQL for copper is 0.050 mg/L.

(iii) Achieve the method detection limit for lead of 0.001 mg/L according to the procedures in appendix B of part 136 of this title. This need only be accomplished if the laboratory will be processing source water composite samples under §141.88(a)(1)(iv).

(iv) Be currently certified by EPA or the State to perform analyses to the specifications described in paragraph (a)(1) of this section.

(2) States have the authority to allow the use of previously collected monitoring data for purposes of monitoring, if the data were collected and analyzed in accordance with the requirements of this subpart.

(3) All lead and copper levels measured between the PQL and MDL must be either reported as measured or they can be reported as one-half the PQL specified for lead and copper in paragraph (a)(1)(ii) of this section. All levels below the lead and copper MDLs must be reported as zero.

(4) All copper levels measured between the PQL and the MDL must be either reported as measured or they can be reported as one-half the PQL (0.025 mg/L). All levels below the copper MDL must be reported as zero.

(b) [Reserved]

II-Detection Limits

A - Inorganic Contaminants- § 141. 23 (a)

(i) If the concentration in the composite sample is greater than or equal to one-fifth of the MCL of any inorganic chemical, then a follow-up sample must be taken within 14 days at each sampling point included in the composite. These samples must be analyzed for the contaminants which exceeded one-fifth of the MCL in the composite sample. Detection limits for each analytical method and MCLs for each inorganic contaminant are the following:

Detection Limits for Inorganic Contaminants

Contaminant	MCL (mg/l)	Methodology	Detection limit (mg/L)
Antimony	0.006	Atomic Absorption; Furnace	0.003
		Atomic Absorption; Platform	0.0008[5]
		ICP-Mass Spectrometry	0.0004
		Hydride-Atomic Absorption	0.001
Arsenic	0.010[6]	Atomic Absorption; Furnace	0.001
		Atomic Absorption; Platform—Stabilized Temperature	0.0005[7]
		Atomic Absorption; Gaseous Hydride	0.001
		ICP-Mass Spectrometry	0.0014[8]
Asbestos	7 MFL[1]	Transmission Electron Microscopy	0.01 MFL
Barium	2	Atomic Absorption; furnace technique	0.002
		Atomic Absorption; direct aspiration	0.1
		Inductively Coupled Plasma	0.002 (0.001)
Beryllium	0.004	Atomic Absorption; Furnace	0.0002
		Atomic Absorption; Platform	0.00002[5]
		Inductively Coupled Plasma[2]	0.0003
		ICP-Mass Spectrometry	0.0003
Cadmium	0.005	Atomic Absorption; furnace technique	0.0001
		Inductively Coupled Plasma	0.001
Chromium	0.1	Atomic Absorption; furnace technique	0.001
		Inductively Coupled Plasma	0.007 (0.001)
Cyanide	0.2	Distillation, Spectrophotometric[3]	0.02
		Distillation, Automated, Spectrophotometric[3]	0.005
		Distillation, Amenable, Spectrophotometric[4]	0.02
		Distillation, Selective Electrode[3, 4]	0.05
		UV, Distillation, Spectrophotometric[9]	0.0005
		Micro Distillation, Flow Injection, Spectrophotometric[3]	0.0006
		Ligand Exchange with Amperometry[4]	0.0005
Mercury	0.002	Manual Cold Vapor Technique	0.0002
		Automated Cold Vapor Technique	0.0002
Nickel	xl	Atomic Absorption; Furnace	0.001
		Atomic Absorption; Platform	0.0006[5]
		Inductively Coupled Plasma[2]	0.005
		ICP-Mass Spectrometry	0.0005

Contaminant	MCL (mg/l)	Methodology	Detection limit (mg/L)
Nitrate	10 (as N)	Manual Cadmium Reduction	0.01
		Automated Hydrazine Reduction	0.01
		Automated Cadmium Reduction	0.05
		Ion Selective Electrode	1
		Ion Chromatography	0.01
		Capillary Ion Electrophoresis	0.076
Nitrite	1 (as N)	Spectrophotometric	0.01
		Automated Cadmium Reduction	0.05
		Manual Cadmium Reduction	0.01
		Ion Chromatography	0.004
		Capillary Ion Electrophoresis	0.103
Selenium	0.05	Atomic Absorption; furnace	0.002
		Atomic Absorption; gaseous hydride	0.002
Thallium	0.002	Atomic Absorption; Furnace	0.001
		Atomic Absorption; Platform	0.0007[5]
		ICP-Mass Spectrometry	0.0003

[1]MFL = million fibers per liter >10 µm.

[2]Using a 2X preconcentration step as noted in Method 200.7. Lower MDLs may be achieved when using a 4X preconcentration.

[3]Screening method for total cyanides.

[4]Measures "free" cyanides when distillation, digestion, or ligand exchange is omitted.

[5]Lower MDLs are reported using stabilized temperature graphite furnace atomic absorption.

[6]The value for arsenic is effective January 23, 2006. Unit then, the MCL is 0.05 mg/L.

[7]The MDL reported for EPA method 200.9 (Atomic Absorption; Platform—Stablized Temperature) was determined using a 2x concentration step during sample digestion. The MDL determined for samples analyzed using direct analyses (*i.e.* , no sample digestion) will be higher. Using multiple depositions, EPA 200.9 is capable of obtaining MDL of 0.0001 mg/L.

[8]Using selective ion monitoring, EPA Method 200.8 (ICP-MS) is capable of obtaining a MDL of 0.0001 mg/L.

[9]Measures total cyanides when UV-digestor is used, and "free" cyanides when UV-digestor is bypassed.

B- Organic chemicals -§ 141.24

(h) Analysis of the contaminants listed in §141.61(c) for the purposes of determining compliance with the maximum contaminant level shall be conducted as follows, with the exception that no monitoring is required for aldicarb, aldicarb sulfoxide or aldicarb sulfone:

(13) Analysis for PCBs shall be conducted as follows using the methods in paragraph (e) of this section:

(i) Each system which monitors for PCBs shall analyze each sample using either Method 508.1, 525.2, 508 or 505. Users of Method 505 may have more difficulty in achieving the required Aroclor detection limits than users of Methods 508.1, 525.2 or 508.

(ii) If PCBs (as one of seven Aroclors) are detected (as designated in this paragraph) in any sample analyzed using Method 505 or 508, the system shall reanalyze the sample using Method 508A to quantitate PCBs (as decachlorobiphenyl).

Aroclor	Detection limit (mg/l)
1016	0.00008
1221	0.02
1232	0.0005
1242	0.0003
1248	0.0001
1254	0.0001
1260	0.0002

Contaminant	Detection limit (mg/l)
Alachlor	.002
Aldicarb	.003
Aldicarb sulfoxide	.004
Aldicarb sulfone	.003
Atrazine	.003
Benzo[a]pyrene	.0002
Carbofuran	.04
Chlordane	.002
Dalapon	.2
1,2–Dibromo–3–chloropropane (DBCP)	.0002
Di (2-ethylhexyl) adipate	.4
Di (2-ethylhexyl) phthalate	.006
Dinoseb	.007
Diquat	.02
2,4-D	.07
Endothall	.1
Endrin	.002
Ethylene dibromide (EDB)	.00005
Glyphosate	.7
Heptachlor	.0004
Heptachlor epoxide	.0002

Contaminant	Detection limit (mg/l)
Hexachlorobenzene	.001
Hexachlorocyclopentadiene	.05
Lindane	.0002
Methoxychlor	.04
Oxamyl	.2
Picloram	.5
Polychlorinated biphenyls (PCBs) (as decachlorobiphenyl)	.0005
Pentachlorophenol	.001
Simazine	.004
Toxaphene	.003
2,3,7,8-TCDD (Dioxin)	.00000003
2,4,5-TP (Silvex)	.05

C- Gross Alpha Particle Activity, Radium 226, Radium 228, and Uranium - § 141.25 (c)

Contaminant	Detection limit
Gross alpha particle activity	3 pCi/L.
Radium 226	1 pCi/L.
Radium 228	1 pCi/L.
Uranium	1 µg/L

Detection Limits for Man-made Beta Particle and Photon Emitters

Radionuclide	Detection limit
Tritium	1,000 pCi/1.
Strontium–89	10 pCi/1.
Strontium–90	2 pCi/1.
Iodine–131	1 pCi/1.
Cesium–134	10 pCi/1.
Gross beta	4 pCi/1.
Other radionuclides	1/10 of the applicable limit.

III- Maximum Contaminant Levels (MCL)

A- Microbiology Contaminants -§ 141.63

(a) The MCL is based on the presence or absence of total coliforms in a sample, rather than coliform density.

(1) For a system which collects at least 40 samples per month, if no more than 5.0 percent of the samples collected during a month are total coliform-positive, the system is in compliance with the MCL for total coliforms.

(2) For a system which collects fewer than 40 samples/month, if no more than one sample collected during a month is total coliform-positive, the system is in compliance with the MCL for total coliforms.

(b) Any fecal coliform-positive repeat sample or *E. coli* -positive repeat sample, or any total coliform-positive repeat sample following a fecal coliform-positive or *E. coli* -positive routine sample constitutes a violation of the MCL for total coliforms. For purposes of the public notification requirements in subpart Q, this is a violation that may pose an acute risk to health.

(c) A public water system must determine compliance with the MCL for total coliforms in paragraphs (a) and (b) of this section for each month in which it is required to monitor for total coliforms.

B- Inorganic Contaminants § 141.62

(b) The maximum contaminant levels for inorganic contaminants specified in paragraphs (b) (2)–(6), (b)(10), and (b) (11)–(16) of this section apply to community water systems and non-transient, non-community water systems. The maximum contaminant level specified in paragraph (b)(1) of this section only applies to community water systems. The maximum contaminant levels specified in (b)(7), (b)(8), and (b)(9) of this section apply to community water systems; non-transient, non-community water systems; and transient non-community water systems.

Contaminant	MCL (mg/l)
(1) Fluoride	4.0
(2) Asbestos	7 Million Fibers/liter (longer than 10 µm).
(3) Barium	2
(4) Cadmium	0.005
(5) Chromium	0.1
(6) Mercury	0.002
(7) Nitrate	10 (as Nitrogen)
(8) Nitrite	1 (as Nitrogen)
(9) Total Nitrate and Nitrite	10 (as Nitrogen)

Contaminant	MCL (mg/l)
(10) Selenium	0.05
(11) Antimony	0.006
(12) Beryllium	0.004
(13) Cyanide (as free Cyanide)	0.2
(14) [Reserved]	
(15) Thallium	0.002
(16) Arsenic	0.010

C- Organic contaminants - § 141.61

(a) The following maximum contaminant levels for organic contaminants apply to community and non-transient, non-community water systems.

Contaminant	MCL (mg/l)
Vinyl chloride	0.002
Benzene	0.005
Carbon tetrachloride	0.005
1,2-Dichloroethane	0.005
Trichloroethylene	0.005
para-Dichlorobenzene	0.075
1,1-Dichloroethylene	0.007
1,1,1-Trichloroethane	0.2
cis-1,2-Dichloroethylene	0.07
1,2-Dichloropropane	0.005
Ethylbenzene	0.7
Monochlorobenzene	0.1
o-Dichlorobenzene	0.6
Styrene	0.1
Tetrachloroethylene	0.005
Toluene	1
trans-1,2-Dichloroethylene	0.1
Xylenes (total)	10

Dichloromethane	0.005
1,2,4-Trichloro- benzene	.07
1,1,2-Trichloro- ethane	.005

(c) The following maximum contaminant levels for synthetic organic contaminants apply to community water systems and non-transient, non-community water systems: The following maximum contaminant levels for synthetic organic contaminants apply to community water systems and non-transient, non-community water systems:

Contaminant	MCL (mg/l)
Alachlor	0.002
Aldicarb	0.003
Aldicarb sulfoxide	0.004
Aldicarb sulfone	0.002
Atrazine	0.003
Carbofuran	0.04
Chlordane	0.002
Dibromochloropropane	0.0002
2,4-D	0.07
Ethylene dibromide	0.00005
Heptachlor	0.0004
Heptachlor epoxide	0.0002
Lindane	0.0002
Methoxychlor	0.04
Polychlorinated biphenyls	0.0005
Pentachlorophenol	0.001
Toxaphene	0.003
2,4,5-TP	0.05
Benzo[a]pyrene	0.0002
Dalapon	0.2
Di(2-ethylhexyl) adipate	0.4

Contaminant	MCL (mg/l)
Di(2-ethylhexyl) phthalate	0.006
Dinoseb	0.007
Diquat	0.02
Endothall	0.1
Endrin	0.002
Glyphosate	0.7
Hexacholorbenzene	0.001
Hexachlorocyclopentadiene	0.05
Oxamyl (Vydate)	0.2
Picloram	0.5
Simazine	0.004
2,3,7,8-TCDD (Dioxin)	3×10^{-8}

D- Disinfection byproducts, § 141.64

(a) *Bromate and chlorite.* The maximum contaminant levels (MCLs) and minimum reporting level (MRL) for bromate and chlorite are as follows:

Disinfection byproduct	MCL (mg/L)	MRL (mg/L)
Bromate	0.010	0.0050 or 0.0010
Chlorite	1.0	0.020

(b) TTHM and HAA5. (1) Subpart L—RAA compliance. (i) Compliance dates. Subpart H systems serving 10,000 or more persons must comply with this paragraph (b)(1) beginning January 1, 2002. Subpart H systems serving fewer than 10,000 persons and systems using only ground water not under the direct influence of surface water must comply with this paragraph (b)(1) beginning January 1, 2004. All systems must comply with these MCLs until the date specified for subpart V compliance in §141.620(c).

Disinfection byproduct	MCL (mg/L)
Total trihalomethanes (TTHM)	0.080
Haloacetic acids (five) (HAA5)	0.060

(2) Subpart V—LRAA compliance. (i) Compliance dates. The subpart V MCLs for TTHM and HAA5 must be complied with as a locational running annual average at each monitoring location beginning the date specified for subpart V compliance in §141.620(c).

Disinfection byproduct	MCL (mg/L)	MRL* (mg/L)
Total trihalomethanes (TTHM)	0.080	
Haloacetic acids (five) (HAA5)	0.060	

*When adding the individual trihalomethane or acid haloacetic acid concentrations to calculate the TTHM or HAA5 concentrations, respectively, a zero is used for any analytical result that is less than the MRL concentration for that DBP, unless otherwise specified by the State, as specified on 40 CFR 141.131(b)(2)(iv) .

E- Radionuclides, § 141.66

1. Radionuclide	Critical organ	pCi per liter
2. Tritium	Total body	20,000
3. Strontium-90	Bone Marrow	8

MCL for uranium. The maximum contaminant level for uranium is 30 µg/L.

F- Residual disinfectant levels, § 141.65

(a) Maximum residual disinfectant levels (MRDLs) are as follows:

Disinfectant residual	MRDL (mg/L)
Chlorine	4.0 (as Cl_2).
Chloramines	4.0 (as Cl_2).
Chlorine dioxide	0.8 (as ClO_2).

Appendix 7

Sample Collector and Certified Laboratory Compliance Log

Sample Collector and Certified Laboratory Compliance Log

I. Introduction

The Sample Collector and Certified Laboratory Compliance Log was developed with the purpose to establish a uniform process for the revision/evaluation of the sample collector and certified laboratory information from the drinking water analysis results received. Refer to the *Protocol for Evaluation of Drinking Water Analysis Results* for more details.

II. Instructions

A. The corresponding Coordinator will review the analysis results received using the Sample Collector and Certified Laboratory Compliance Log provided in Section III. This *Log* will be maintained in the corresponding coordinator's office file cabinets and will be readily available when requested during or as a result of internal assessments.

B. Complete the *Log*:

1. Description Review:
   a. **PWS ID:** Provide the system's PWS-ID.
   b. **System name:** Provide the system's name.
   c. **Certified Laboratory:** Provide the name of the certified laboratory.
   d. **Type of Analysis:** Determine is the analysis is microbiological (micro) or chemical (chem).
   e. **Collection Date:** Provide the date the sampling was performed in the month/day/year format.
   f. **Collector's Name:** Provide the sample collector's name.
   g. **Certified:** Determine collector's certification. Write Yes (Y) or No (N).
   h. **Certification Ends:** Provide the collector's certification expiration date in the month/day/year format.
   i. **Date Reviewed:** Provide the date of revision in the month/day/year format.
   j. **Initials:** Provide the reviewer's signature initials.
   k. **Reviewed by:** Provide the reviewer's full name.
   l. **Title:** Provide the reviewer's work title or position.
2. Specify not applicable information as N/A.

III. Results Reviewing Checklist Table

The *Sample Collector and Certified Laboratory Compliance Log* is found in the following page.

DEPARTAMENTO DE SALUD
GOBIERNO DE PUERTO RICO
DIVISION DE AGUA POTABLE

Sample Collector and Certified Laboratory Compliance Log

Results Evaluation Protocol
(Article II.B, Sections e and f)

PWS ID	Systems Name	Certified Laboratory	Type of Analysis (Micro or Chem)	Collection Date	Collector's Name	Certified (Y or N)	Certification Ends	Date Reviewed	Initials

* Note: This table must be accompanied by its corresponding instructions.

Reviewed By: _____

Title: _____

Appendix 8

40 CFR §142.14

§ 142.14 Records kept by States*

(a) Each State which has primary enforcement responsibility shall maintain records of tests, measurements, analyses, decisions, and determinations performed on each public water system to determine compliance with applicable provisions of State primary drinking water regulations.

(1) Records of microbiological analyses shall be retained for not less than 1 year. Actual laboratory reports may be kept or data may be transferred to tabular summaries, provided that the information retained includes:

(i) The analytical method used;

(ii) The number of samples analyzed each month;

(iii) The analytical results, set forth in a form which makes possible comparison with the limits specified in §§141.63, 141.71, and 141.72 of this chapter.

(2) Records of microbiological analyses of repeat or special samples shall be retained for not less than one year in the form of actual laboratory reports or in an appropriate summary form.

(6) Records for analysis other than microbiological contaminants (including total coliform, fecal coliform, and heterotrophic plate count), residual disinfectant concentration, other parameters necessary to determine disinfection effectiveness (including temperature and pH measurements), and turbidity shall be retained for not less than 12 years and shall include at least the following information:

(i) Date and place of sampling.

(ii) Date and result of analyses.

(c) Each State which has primary enforcement responsibility shall maintain current inventory information for every public water system in the State and shall retain inventory records of public water systems for not less than 12 years.

(d) Each State which has primary enforcement responsibility shall retain, for not less than 12 years, files which shall include for each such public water system in the State:

(1) Reports of sanitary surveys;

(2) Records of any State approvals;

(3) Records of any enforcement actions.

(5) A record of all current monitoring requirements and the most recent monitoring frequency decision pertaining to each contaminant, including the monitoring results and other data supporting the decision, the State's findings based on the supporting data and any additional bases for such decision; except that the record shall be kept in perpetuity or until a more recent monitoring frequency decision has been issued.

(6) A record of the most recent asbestos repeat monitoring determination, including the monitoring results and other data supporting the determination, the State's findings based on the supporting data and any additional bases for the determination and the repeat monitoring frequency; except that these records shall be maintained in perpetuity or until a more current repeat monitoring determination has been issued.

(8) Records of the currently applicable or most recent State determinations, including all supporting information and an explanation of the technical basis for each decision, made under the following provisions of 40 CFR, part 141, subpart I for the control of lead and copper:

(15) List of laboratories approved for analyses in accordance with §141.131(b) of this chapter.

(16) List of systems required to monitor for disinfectants and disinfection byproducts in accordance with part 141, subpart L of this chapter. The list must indicate what disinfectants and DBPs, other than chlorine, TTHM, and HAA5, if any, are measured

*Information adapted from Code of Federal Regulations, Title 40-Protection of Environment, Chapter I-Environmental Protection Agency, Subchapter D-Water Programs, Part 142-National Primary Drinking Water Regulations Implementation, e-CFR Data current as of January 13, 2011.